Productive Programming in Chapel: A Next-Generation Parallel Language

Chapel Team, Cray Inc.

SC11: November 14th, 2011

What is Chapel?

- A new parallel programming language
  - Design and development led by Cray Inc.
  - Initiated under the DARPA HPCS program
- **Overall goal:** Improve programmer productivity
  - Improve the programmability of parallel computers
  - Match or beat the performance of current programming models
  - Support better portability than current programming models
  - Improve the robustness of parallel codes
- A work-in-progress

Chapel's Implementation

- Being developed as open source at SourceForge
- Licensed as BSD software
- **Target Architectures:**
  - multicore desktops and laptops
  - commodity clusters
  - Cray architectures
  - systems from other vendors
  - (in-progress: CPU+accelerator hybrids, manycore, …)

Today's Goals

- Introduce you to the Chapel language in-depth
  - motivating themes
  - central language concepts
  - project status
- Give you experience…

  …using the Chapel compiler

  …writing Chapel code
- Point you toward resources for future reference
- Get your feedback on Chapel

Our Team For Today's Tutorial

- Brad Chamberlain
- Sung-Eun Choi
- Tom Hildebrandt
- Vass Litvinov
- Greg Titus





Who Are You?

Type of Institution?

- Academic, Industry, HPC Lab, Gov't, …

Role?

- Student, postdoc, faculty, developer, researcher, …

Favorite Languages?

- Fortran, C, C++, Java, Matlab, Python, Perl, C#, …

Parallel Programming Models?

- MPI, OpenMP, Co-Array Fortran, UPC, pthreads, …

Ground Rules

- Please ask questions as we go
- Also feel free to ask questions of any of us during the breaks, lunch, and hands-on sessions

This Morning You Should Receive

1. A Chapel USB Stick with…
   - the final tutorial slides
   - the Chapel release
   - today's hands-on exercises
   - a bunch of other Chapel documents/slides

2. A Chapel-specific survey on the tutorial and language
   - please complete during breaks/hands-on
     - return to us by the end of the day
   - **Note:** SC11 also has a survey you should complete today
     - return these to the student volunteers

Today's Plan

8:30 – Welcome
8:40 – Background
9:00 – Base Language
9:45 – Data Parallelism
10:00 – Break
10:30 – Data Parallelism
11:00 – Hands-On I
12:00 – Lunch

1:30 – Task Parallelism
1:55 – Locales
2:20 – Domain Maps
2:45 – Sample Codes
3:00 – Break
3:30 – Project Overview
3:50 – Hands-On II
4:50 – Wrap-up
5:00 – Done!
5:30 – CHUG Happy Hour!!